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AUTHOR Lloyd, Geoffrey
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ABSTRACT

The Broad System of Ordering (BSO), a subject-indication coding and ordering scheme developed to meet the requirements of the UNISIST program for an international switching mechanism between information systems using diverse indexing/retrieval languages is described. The scope and purpose of the BSO, its development and testing, a schematic outline of the schedule, and an explanation of its main features (facet design, treatment of composite subjects, notation, and alphabetical index) are presented. The report concludes with a brief review of future needs and prospects for the new ordering system. (Author/BAO)

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# BSO - Broad System of Ordering

by

Geoffrey LLOYD
Formerly of FID Classification Department
The Hague, Netherlands

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# BSO- BROAD SYSTEM OF ORDERING

by Geoffrey LLOYD
(formerly of FID Classification Department,
The Hague, Netherlands)

This paper describes the BSO, its scope and purpose, development and testing; includes a schematic outline of the schedule and explains the main structural features (facet design, treatment of composite subjects, notation, etc.); and concludes with a brief review of future needs and prospects for the new ordering system.

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The Broad System of Ordering (BSO) is a subject-indication coding and ordering scheme (with about 5000 scheduled descriptors and an A/Z index), which has been developed as a joint FID/UNESCO project to meet an important requirement in the UNISIST programme for an international 'switching mechanism between information systems using diverse indexing/retrieval languages'. UNISIST is the name of a joint project by UNESCO and ICSU (International Council of Scientific Unions) for a World science information system, on which a feasibility study was begun in the late 1960s and published as a Study Report in 1971.

SCOPE & PURPOSE OF THE BSO

'Scientific information' in its broadest sense, especially in view of UNESCO's educational and cultural interests which are wider than the scientific interests of ICSU, virtually covers the whole realm of knowledge, so that the worldwide switching mechanism for interconnecting information systems in a UNISIST network must provide a subject-ordering scheme for all disciplines and branches of knowledge, as well as for interdisciplinary relationships. Since most or many of the participating information centres and services within such a network will not wish to abandon their own special indexing/retrieval languages to adopt one standard international classification, the only feasible alternative is to adopt or establish some arbitrary scheme that can hope to gain acceptance as an intermediary or switching code for the whole network with all its participants.

Why, then, was it necessary to construct a new BSO instead of adopting one of the several wellknown general classifications in worldwide use today? In fact the Universal Decimal Classification (UDC), adapted more than 80 years ago from the Dewey Decimal Classification (DC) by Otlet and La Fontaine mainly for their comprehensive card-index to all published information ('Répertoire Bibliographique Universel'), was mentioned in the UNISIST Study Report of 1971 as the least unsatisfactory of the existing encyclopaedic classifications, but rejected (with

others) pending further studies to improve management and revision procedure, and criticized for the infrequency of published up-to-date editions, as well as for certain inadequacies of content and structure. The Dewey DC, though perhaps less open to criticism of management, thanks to the efforts of its editor Ben Custer, could hardly satisfy the content and structure criteria even as well as the UDC. The Library of Congress List of Subject Headings and the Colon Classification, though mentioned as competitors, fared no better, while the Bibliographic Classification of Bliss (with which the BSO has most in common in the matter of order and structure) got no mention at all!

DEVELOPMENT & TESTING OF THE BSO

Faced with this situation, the FID Central Classification Committee (CCC) made a determined attempt to promote a drastically restructured 'roof scheme' for the UDC as a possible candidate, but at the FID Budapest Conference in 1972 it was decided to pass over this and to set up a special working group (jointly from the CCC and FID/CR Classification Research) to try and elaborate a new broad scheme for UNISIST. During the first year or two (1973-74), this Working Group FID/SRC (Subject-field Reference Code) did much valuable preparatory work for the new scheme, including a study of possible applications and, above all, the definition, collection and listing of 'organized information sources' as the basis for establishing subject-fields to be included and displayed in an ordered concept system. This use of 'institutional warrant' as the criterion for cut-off of detail specification and inclusion in the broad scheme was an unusual feature of the methodology adopted, as also was the subsequent consultation with more than 100 potential users and submission of the scheme to a field test with cooperation of 26 institutional participants.

By the end of 1974, however, it was clear that there was a sharp division of views within the Working Group FID/SRC, resulting in two incompatible draft schemes neither of which obtained substantial approval at a joint meeting with four UNISIST representatives in 1974 September. A small panel was therefore appointed from the FID/SRC membership, charged with working out a compromise acceptable for UNISIST: members of this newly named BSO Panel were E.J. Coates (Great Britain), D.Simandl (Czechoslovakia) and G.A.Lloyd (then still at the FID Classification Department), the last serving as rapporteur until mid-1977, when Coates took over responsibility. It is largely thanks to Coates's energy and expertise

that the raw BSO draft was refined, completed, subjected to a field test in 1977 and finally published in 1978 as "BSO - Broad System of Ordering: schedule & index (3rd revision)", FID 564. An outline of the purpose, structure and combination facilities for composite subjects is given in more detail (than in this paper) in the Introduction to FID 564, but those who wish for a still more detailed explanation, including a full description of the field test and the practical application of the system, should consult the new 1979 BSO Manual, which also contains a specimen file of more than 700 BSO-coded international organizations and abstracting services used as sample information sources for the field test.

The 1977 field test was an extensive exercise by 26 cooperating institutions, each of whom was asked to assign BSO codes to 150 sample information sources, viz. 50 organizations taken from the 1974 Yearbook of International Organizations, and 100 abstracting & indexing services, 50 from Ulrich's International Periodicals Directory and 50 from the FID's Abstracting Services (vols.1& 2, 1969, FID 455 &456). Carried out before the 3rd revision of the BSO, the test showed 43% agreement between the testers' answers and the BSO Panel's 'control answers': had the 3rd revision of BSO (1978 publication) been used, taking account of the lessons learned from the tests, there would almost certainly have been at least 55% agreement; and if the testers had been given some prior practice and familiarization with the BSO before doing the test, agreement might well have reached 70%. Such a result compares favourably with results commonly obtained with many of the wellknown general classification systems like the DC and UDC, even when the classifiers are thoroughly familiar with the system they are using.

BSO ORDER, STRUCTURAL FEATURES & NOTATION

Although the UNISIST requirements for a switching language provided a general target for FID/SRC and the BSO Panel, the devising of the BSO led to a reappraisal of much of the classification practice since the appearance of the DC and UDC at the end of the last century, and also to the realization within a single scheme of much of the classification theory during the same period, especially of facet theory. The BSO is not only a subject-indicating code but also an ordering system, as clearly expressed in its name : it tries to provide sufficient specificity to permit coding any subject-field for which there exists an organized information source; at the same time, its schedule offers a coherent display of all subject-fields, both at the broadest and the more specific levels, in an order that can claim to be reasonably intelligible and easily remembered anywhere in the world, and that attempts to reflect a broad consensus among information workers today.

BSO outline scheme

A ring diagram may serve to display the continuity of subject-field order in BSO with its three separate elements: (A) area 100 providing the basic methodological sciences & techniques applicable to many fields; (B) area 200 to 588, which is mainly a sequence of sciences ranging in ascending order of complexity ('integrative levels') from the physical sciences, passing up through the life sciences to the social sciences; (C) area 600 to 992 offering a sequence of subject-fields, each of which is focussed on a product of human activity – technological, linguistic, artistic or spiritual.

500 HUMANITIES, CULTURAL & SOCIAL SCIENCES 500
480 Sports & games
470 Human needs: food, home, work & leisure
460 Education & training
450 Psychology
445 BEHAVIOURAL SCIENCES
420 Medicine, therapeutics, surgery
..439 & specialties. Psychiatry
411 Human biology
410 Biomedical sciences
390 Environment & natural resources
380 Wildlife exploitation
370 Forestry
368 Veterinary science
360 Agriculture, plant and
..366 animal husbandry
340 Zoology, animal biology
330 Botany, plant biology
320 Microbiology & virology
310 Biological sciences (general)
300 LIFE SCIENCES (310 to 439)
290 Geography
270 Geology, incl. palaeontology
260 Earth sciences. Geodesy. Geophysical sciences
252 Astronomy & astrophysics
250 Space & earth sciences
230 Chemistry
228 Crystallography
210 Physics
205 PHYSICAL SCIENCES (210 to 290)
203 Natural sciences (210 to 340)
200 SCIENCE & TECHNOLOGY (TOGETHER)
182/8 Research. Inventions, patents. Testing. Metrology
166 Standardization & standards
165 Management (generally)
160 Systemology & cybernetics
150 Communication sciences. Reprography. Printing. Publicity
140 Information sciences
120 Mathematics & computer science
118 Logic, methodology
116 Science of science
112 Philosophy
100 KNOWLEDGE GENERALLY

History, archaeology & prehistory 510
Area studies (life, culture) 520
Social groups & communities 528
SOCIAL SCIENCES (GENERALLY) 530
incl. Sociology & Demography ..537
Political science & Politics 540
Public administration 550
Law. Juridical sciences 560
Social welfare & services 570
Economics 580
Enterprise management 538

TECHNOLOGY. ENGINEERING. Equipment. Systems engng, etc. 600
Production technology 620
Energy & materials technology 631/5
Nuclear technology 640
Electrotechnology 650
Thermal engineering 670
Mechanical engineering 680
Construction tech. Civil engng. Architecture. Physical planning 710 ..726
Environmental technology. Health & safety engineering 730 ..738
Transport technology (land, water, air & space) 740
Military science & technology 760
Mining, oil & gas extraction 780
Process industries. Chemical technology & engineering 800 ..817
Chemicals. Petroleum. Natural oils & fats. Polymers 823 ..828
Processing agents. Fuels. Colour industry. Pharmaceuticals 831 ..838
Food & drink technology 840
Non-metal mineral technologies 850
Metal technology. Metallurgy 860
Wood. Pulp & paper. Leather. Textiles & cordage 872 ..878
Products not in 600 to 878 890

LANGUAGE. LINGUISTICS & LITERATURE 910 ..928
ARTS. Fine arts & handicrafts. (Plastic, Graphic, Decorative) 940
Music & the Performing arts 950
RELIGION & ATHEISM 970
Esoteric movements. Occultism &c. 992

Basis of subject-field order in the BSO

Influenced as it was by integrative level theory, the BSO Panel arrived at the order shown in the outline mainly by a process of eliminating what seemed less useful alternatives and adopting what appeared to reflect a broad consensus of recent and traditional tendencies, notably in the work on the new edition of the Bliss Bibliographic Classification by Jack Mills, in some of the bolder plans for UDC structural reform, and in the studies of Ingetraut Dahlberg (viz. "Grundlagen universaler Wissensordnung", München 1974). Traditional schemes like DC and UDC have played a part in keeping technology (600 to 890 in BSO) separate from the parent physical sciences (210 to 270), but while it is relatively easy to justify that separation, it is less easy to separate the life sciences (300 to 439 in BSO) and impossible to separate the biomedical sciences (410 to 439) into 'pure' and 'applied' sectors in the same way. Hence, while engineering and process industries are widely separated from their parent sciences, agricultural and related applications are collocated with their parent biological sciences, and the pure and applied approaches in the biomedical sciences are closely intermingled.

Facet design in the BSO

It has been a paramount consideration in the design of the BSO, which is in fact fully faceted – though facets are not labelled as such, to minimize effort in applying the BSO and in its future updating.

There are three generally applicable facets:-

(1) Time facet -01... (2) Place facet -02... (with ISO 2-letter country code) added only as suffixes to BSO subject-field codes 100 to 992, and never to be used as independent codings;

(3) an Optional facet for Types of information source used after the subject-field notation proper, from which the codes 18 to 40 are separated by two blank spaces (but no symbol).

This optional facet was introduced only in 1978 in the published schedule, following clear indications from field tests that they were needed.

Moreover, in each subject-field 100 to 992 the detailed divisions and subdivisions are arranged (wherever possible) in a facet pattern, widely repeated throughout the scheme, giving the following sequence:

Tools or equipment (for operations)
Operations
Processes, interactions
Parts, subsystems of objects of study or of products
Objects of study or products, or total systems.

Composite subjects & combination facilities

Related to the schedule sequence just mentioned is the citation order for forming composite subject codes. Where both elements of a composite subject fall within the same broad subject-field or 'combination area' (there are some 43 such areas listed in the 1978 BSO), their citation order is the reverse of the schedule sequence. For such 'internal combinations', the linkage may be prescribed as an 'Expand like...' or 'Expand by adding...' note, of which there are many distributed throughout the schedule. If there is no such prescription, the regular link symbol ,0, (substituting the first digit of the BSO code for the second element) or for technology ,06, or ,07, or ,08, (substituted for the first digit of 600, 700, 800) must be used to produce a notation which is longer but still ensures correct order.

Where the two elements of a composite subject belong to different disciplines and fall under separate subject-fields or combination areas, the 'external combination' device is simply a dash or hyphen, which must not be used indiscriminately for all relationships, as so often in UDC the colon is. Examples are:

460-535 Education - sociology (= Sociology of education)
780-580 Mining - economics (= Economics of mining)

Here, the citation order of the elements must be determined by the meaning, i.e. by the relationship linking the two elements, and the following rule is established:

- cite first the notation for the element denoting application area, mission, purpose, end-product or whole system
- cite second the notation for the element denoting aspect, approach, action applied, agent, or part of a stated whole.

Thus, in the example 460-535 above, Education is the application area, while Sociology is the aspect or approach: reversal of the codes of the two elements to 535-460 would change the meaning to Education in sociology !

Multi-aspect subjects

In most of the established general classifications, little or no provision is made for subjects from a general, multi-disciplinary or non-disciplinary point of view, but the BSO Panel has noted that such subjects can occur, even at institutional level, and has adopted an ad hoc solution. When not placeable in the two non-disciplinary areas 470 Human needs and 528 Social groups, multi- or non-disciplinary subjects in the BSO may be coded at 088 (immediately preceding 100) by adding the notation for the material or organism in the discipline that contains the properties uniquely defining that material or organism. Thus:-

088,225,80 Liquids (in all their aspects), uniquely defined by properties belonging to the discipline Physics, where liquids are 225,80.

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BSO Notation

While the facet structure and controlled combination facilities in the BSO are largely aimed at minimizing decision problems in applying the scheme, the partial sacrifice of notational brevity and 'hierarchical expressiveness' in favour of more flexibility and hospitality to new knowledge should greatly facilitate updating the BSO. Arabic numerals have been preferred to letters or mixed letters and numerals for the basic notation, since they are more internationally acceptable and avoid confusion with the use of A/Z ordering for names of persons, countries and other individual entities.

BSO structure, however, is in no way dependent on the present notation, which could be replaced by another without affecting the essential character of the system. The initial 3-figure (millesimal) notation superficially resembles that of the DC (if not also the UDC), but the further 2-figure (centesimal) arrays, separated by commas, give a rather distinctive 3,2,2... pattern, though notational combinations inevitably produce variations of this. BSO notation is indeed oriented towards human users (rather than to machine handling) but its transformation to a fully computer-oriented notation should not present a serious problem.

Alphabetical index

An A/Z subject index to the schedule is of course an integral part of the BSO, though it should not be used for assigning codes without checking in the schedule. In any linear ordering of schedules, some subject-fields are inevitably separated; though there are copious cross-references in the BSO schedule, the index serves as a last-line defence to ensure that these 'distributed relatives' are not overlooked.

FUTURE PROGRAMME & PROSPECTS FOR THE BSO

The 1977 field test (mentioned earlier) gave reasonably encouraging results with 26 independently cooperating institutions in a straight coding test of 150 information sources. An important need now is a test of BSO switching function between locally used special indexing languages in an actual exchange procedure. For this, we need the cooperation of two information centres (A and B) with different core or focal interests but related by common marginal interests, each with its own indexing language (AL and BL respectively), e.g. centre A focussed on Instrumentation and centre B on Electronic engineering. The procedure might then be as follows:

1) Centre A provides a sample of, say, 500 items indexed by language AL
2) the BSO Panel applies BSO codes to all items in the sample
3) the BSO Panel re-indexes the BSO-coded items to indexing language BL
4) Centre B evaluates the material so transmitted.

This evaluation by centre B could cover such matters as

- new/relevant material which would not otherwise have been recorded there
- usefulness/limitations of coarse indexing of received material
- effort required to compensate for such limitations.

Future prospects for the BSO

The 1978 BSO, as might be expected, has had a mixed reception. Most of those who have sent in comments seem to think it a good attempt to meet the requirements of UNISIST, though certain features are subject to criticism, some of which can be answered and a few taken into account as amendments or extensions to the schedule. Some seem to feel that the BSO Panel has missed opportunities in designing an ordering system without the restraints that have to be accepted in revising established schemes. Others again have welcomed the BSO as a broad general classification for arranging bibliographies or directories, shelving of small collections of documents, and the like: although these go beyond the primary purpose, there is no reason why the BSO should not be used in these modes, though its intentional lack of detail must set a limit to any current use for informational retrieval in depth.

What is of paramount importance at this stage, however, is that the BSO should not be allowed to perish or fade away for want of sufficient organization and management facilities. Without a small secretariat, or at least a permanent editor or officer-in-charge, it could suffer a fate it does not deserve. It is very much in the interests of UNESCO and the FID to ensure that the BSO is given a chance to survive and flourish by the provision of adequate finance and technical expertise, so that it can be tested and tried in everyday practice throughout the world.

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July 1979